Computer Science Department,
College of Computer and Information Sciences,
King Saud University.
CSC 311

Q1: Using the definition of Θ, give a formal proof for:
$0.5n^3 - 4n^2 + 2 \in \Theta(n^3)$.

Q2: Give a formal proof for:
$f(n) \in O(g_1(n))$ and $h(n) \in O(g_2(n)) \Rightarrow f(n) + h(n) \in O(MAX(g_1(n), g_2(n)))$.

Q3 *(Q5, Section 2.3 in the Textbook)*: Order the following functions according to their order of growth (from the lowest to the highest):
$(n-2)!,\ 5\lg(n+100)^{10},\ 2^{2n},\ 0.001n^4,\ 3n^3+1,\ \ln^2 n,\ \sqrt[3]{n},\ 3^n$.

Q4: What is the time complexity of the following algorithm? Find the operation count as a function of the input size and a tight O estimate (you don't need to give a formal proof for the O estimate).

Algorithm 1: Y Algorithm

```
Y Algorithm(A[0..n − 1])
for i:=0..⌊n/2⌋-1 do
    for j:=i..n − 1 do
        A[j]:=A[j] + A[i];
    end
end
```